



Engineering Research Center on Mid-Infrared Technologies for Health and the Environment (MIRTHE)

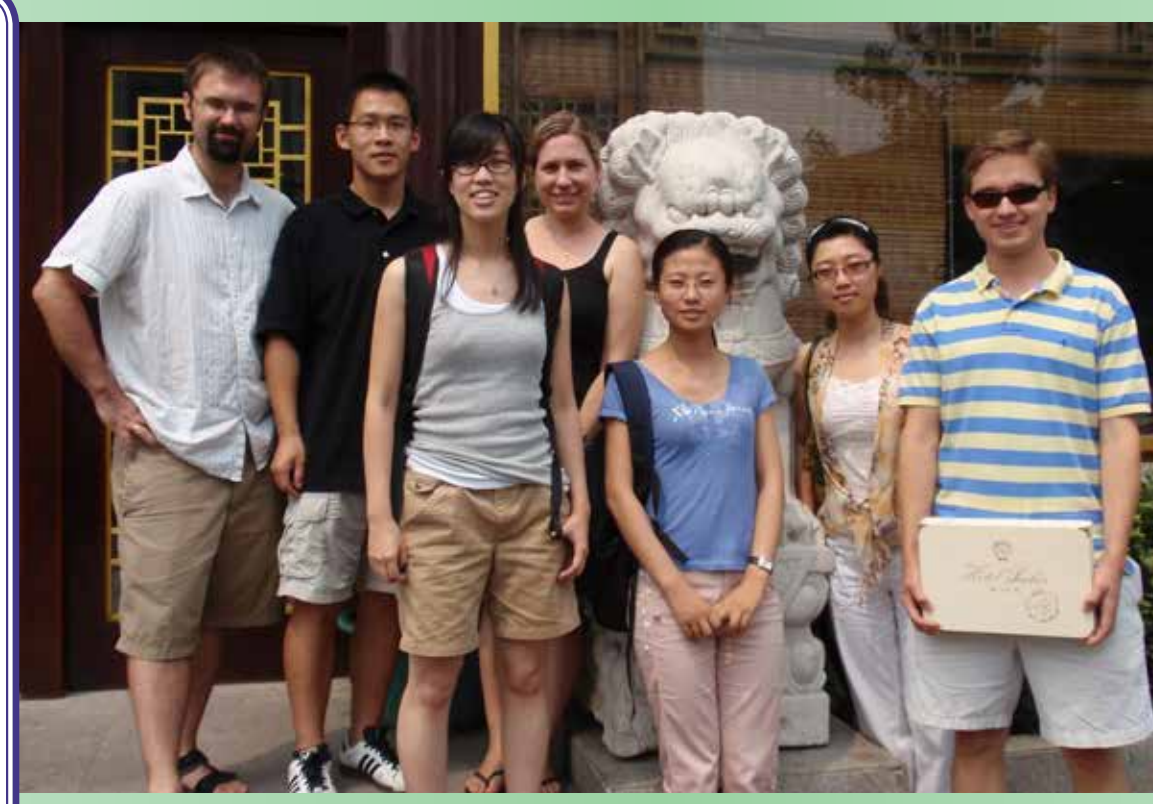


Graduate Student Highlights

Field Campaigns

Modeling and Monitoring of Air Quality and Regional Climate during the 2008 Olympic Games in Beijing, China, by a team of MIRTHE's Engineering Research Center MIRTHE: James A. Smith, Anna P. Michel, Yan Zhang, George Wysocki, et al. MIRTHE EEC-0540832

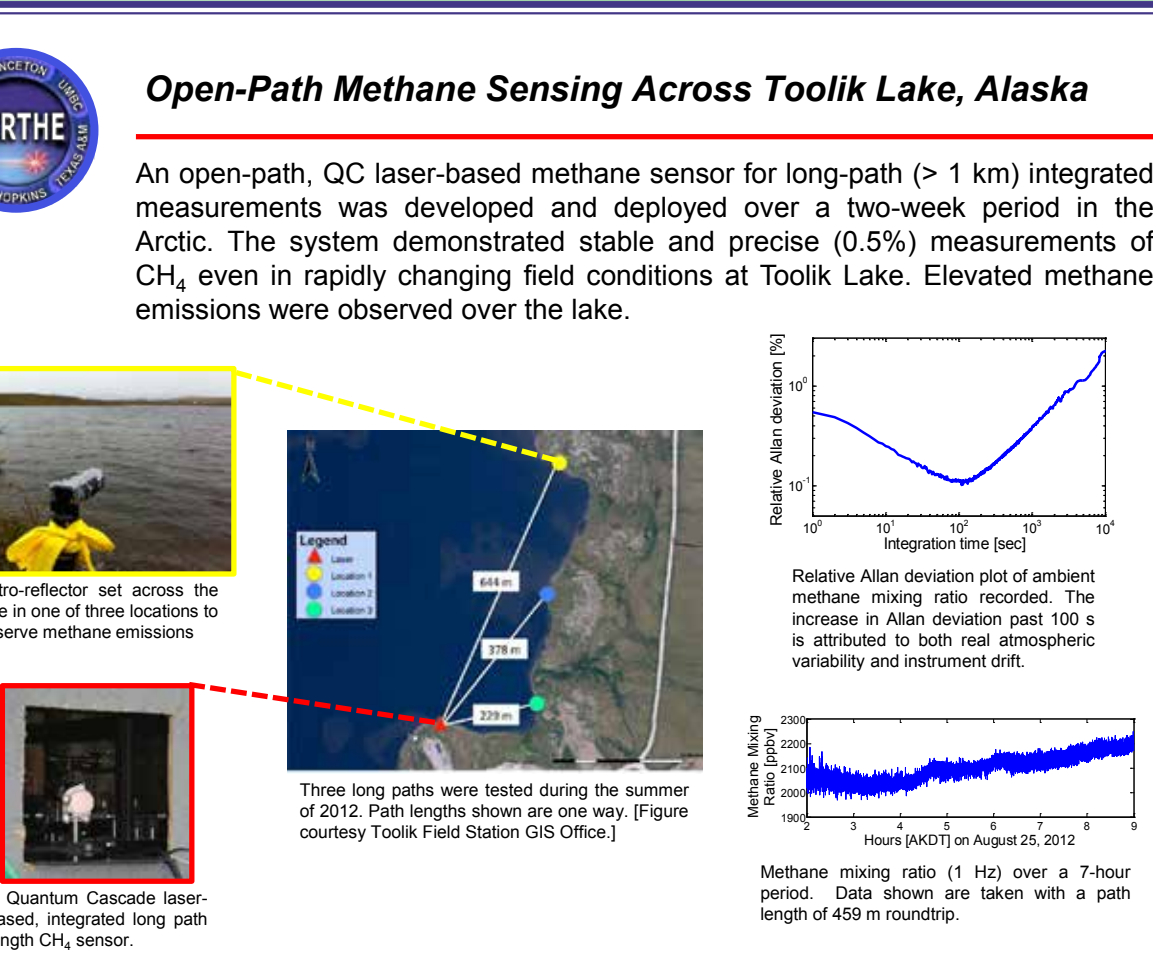
The 2008 Olympic Games in Beijing, China, focused the world's attention on air quality and climate. Beijing, China, has a long history of air quality issues, including its frequent "haze" and smog. The Beijing 2008 Olympic Games provided an opportunity to study the impact of air quality on human health and the environment. The Center was selected to evaluate the impact of air quality on human health and the environment. The Center was selected to evaluate the impact of air quality on human health and the environment. The Center was selected to evaluate the impact of air quality on human health and the environment.



Graduate students and Post-docs in Beijing, China doing research during the 2008 Olympics.

Open-Path Methane Sensing Across Toolik Lake, Alaska

An open-path, GC laser-based methane sensor for long-path (> 1 km) integrated measurements was developed and deployed over a two-week period in the Arctic. The system demonstrated stable and precise (0.5%) measurements of CH₄ even in rapidly changing field conditions at Toolik Lake. Elevated methane emissions were observed over the lake.



Anna Michel, Associate Research Scholar, Levi Stanton, Undergraduate, and David Miller, Graduate at Toolik Lake, AK, 2012.

MIRTHE allowed me to network, gave me field work opportunities, and allowed me to learn a new area of chemical sensing. MIRTHE strengthened my scientific background while also allowing me to be very involved with educational opportunities.

— Anna Michel, MIRTHE post-doc, currently Assistant Scholar at Woods Hole Oceanographic Institution

The First MIRTHE SLIP Grant

A Multi-sensor Field Deployment for Assessing Anthropogenic Influences on Carbon, Nitrogen and Water Cycling

A multi-disciplinary, cross-institutional team:

- 8 graduate student PIs
- 4 post-doc fellows
- 4 different research groups
- 2 universities (Princeton, Johns Hopkins)

UMBC Field Site: First simultaneous field measurements by 3 MIRTHE-developed GC laser sensors.

SLIP Participant Feedback:

- "The SLIP project is a really unique opportunity for us as students/post-docs to make big decisions about our research, manage a budget and take care of logistics instead of our advisors."
- "It's great to work with other people in other groups. I learned a lot from colleagues (software, field experiences and so on)."
- "We would never have learned what we did in the field if we were just sitting in the lab all this time."
- "In the field I was much more focused on the research and it was really productive. I could work more than 12 hours per day but did not seem to be tired."

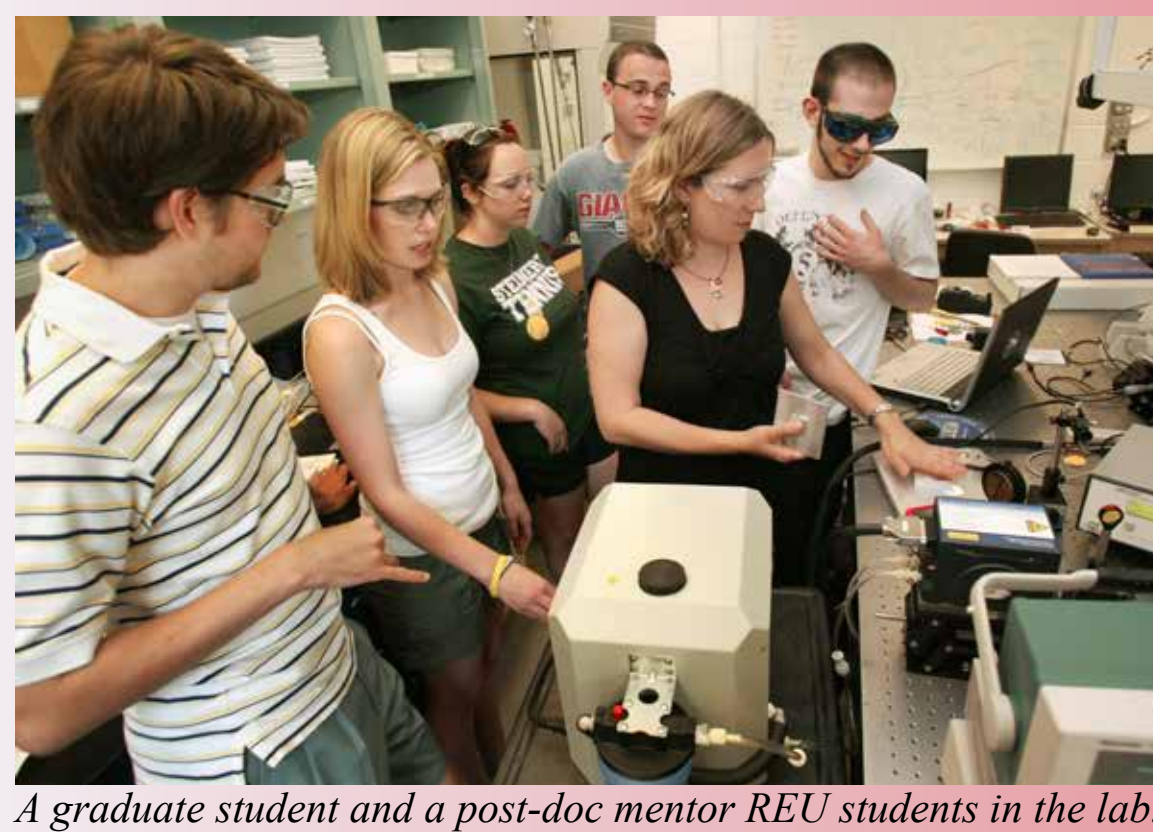
Collaboration & Mentoring



Scott Pittz, Environmental Sciences at JHU, and Clinton Smith, Electrical Engineering at Princeton, prepare for the SLIP deployment.



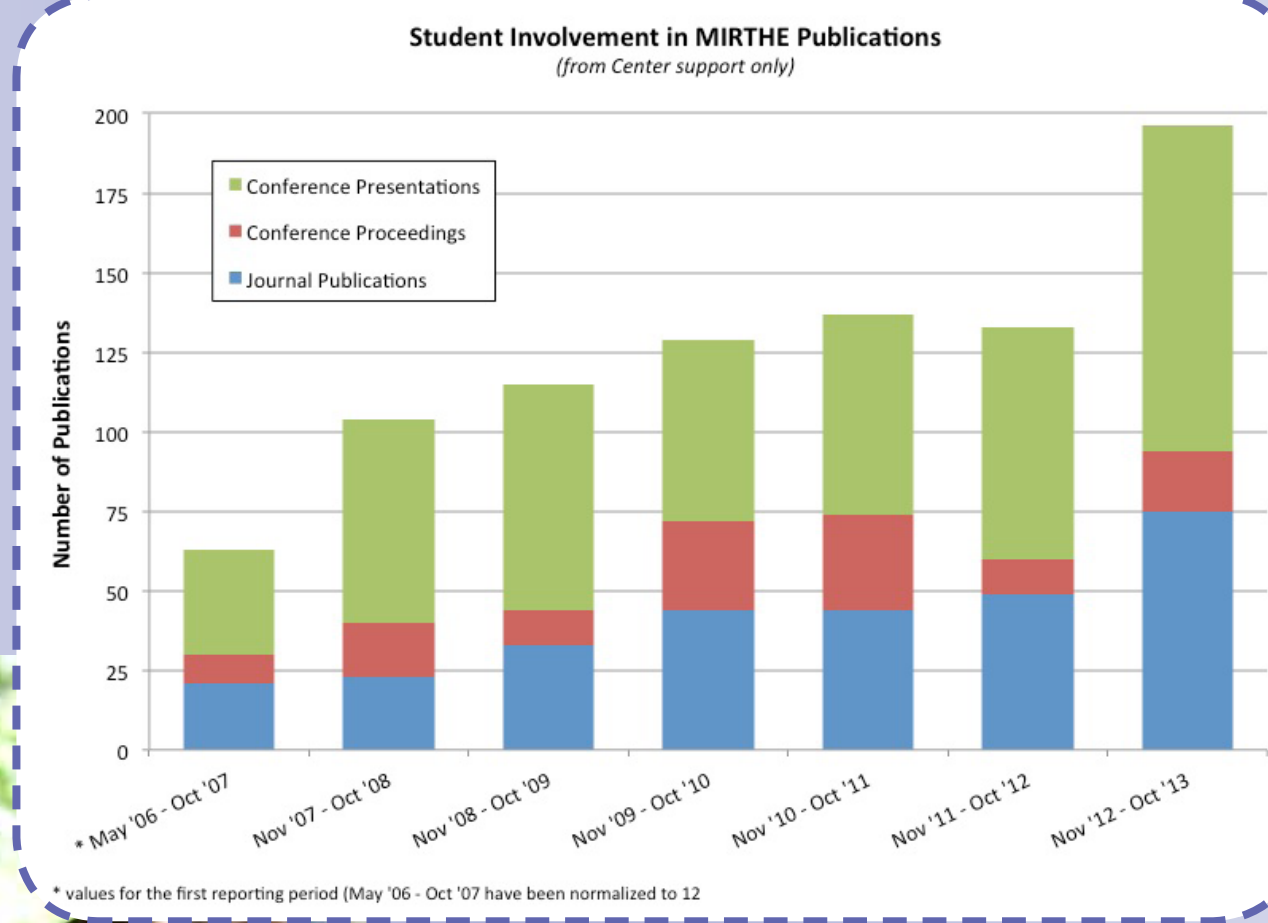
Post-doc Roundtable at CLEO 2011.



A graduate student and a post-doc mentor REU students in the lab.

The MIRTHE's post-doc in industry experience helped me clarify academic and career interests, practice work-related skills, develop communication and collaboration skills through interaction with coworkers, scientists and professors. It also provided opportunities to determine if I can perform the essential functions of specific jobs, requesting accommodations from an employer, using assistive technology in a work setting, and to test which accommodations work best for me.

— Maung Lwing, MIRTHE grad student, now researcher at US Patent and Trademark Office



MIRTHE Graduate students at Commencement, 2011.

One of the greatest things about MIRTHE was the exposure to a broad area of research. It really gave me confidence to try something very different from what I did in graduate school. I see a lot of my peers who feel graduate school boxed them into a certain discipline. I never felt that way and I'm sure my involvement in MIRTHE significantly influenced how I feel about my career today.

— Anthony Hoffman, MIRTHE graduate student, currently Assistant Professor at University of Notre Dame

Interactions with Industry



Students demonstrate the latest innovations at the MIRTHE booth at CLEO 2013.

- Research Collaboration
- Internships
- Start-up Companies
- Innovation Forums
- Networking at Workshops/Conferences



Stephen So, Post-doc, presents his innovation at the 4th Annual Keller Center Innovation Forum.



Graduate student, Darius Morris, talks with an industry member during the 2009 SLC Retreat with Industry.

Innovation & Business Plan Competitions

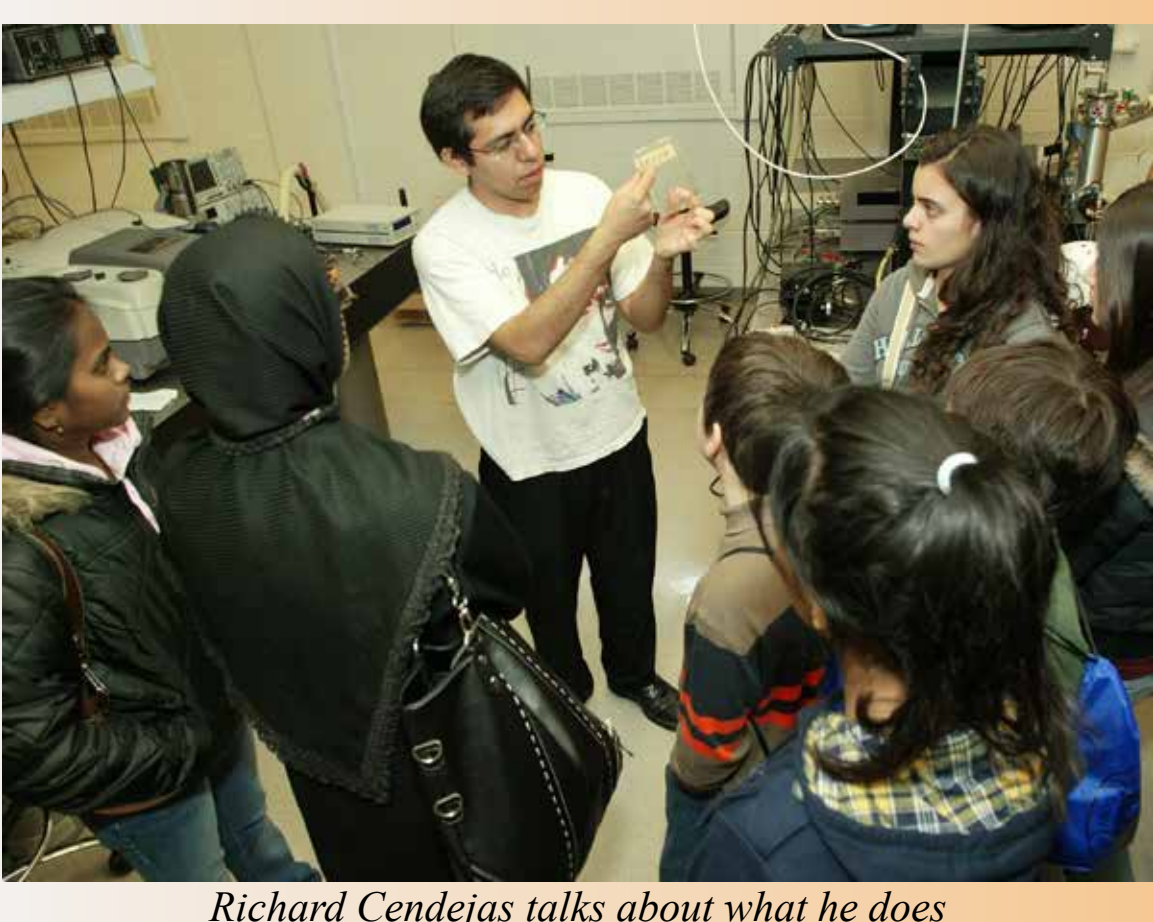
- 2009: Stephen So, Post-doc, placed 2nd in the 4th Annual Keller Center Innovation Forum
- 2011: Tracy Tsai, Graduate student, placed 2nd in the NSF-ERC Elevator Pitch Contest
- 2012: Michal Nikodem, Post-doc, placed 2nd in the 7th Annual Keller Center Innovation Forum
- 2012: Yin Wang, Graduate Student, placed 2nd in the Optoelectronics Start-up Challenge at Photonics West
- 2013: Lei Tao, Post-doc, placed 1st, and Arvind Ravikummar, Graduate student, placed 3rd at the 8th Annual Keller Center Innovation Forum



Lei Tao (right) and Arvind Ravikummar (left) named winners at the 8th Annual Keller Center Innovation Forum.

Outreach

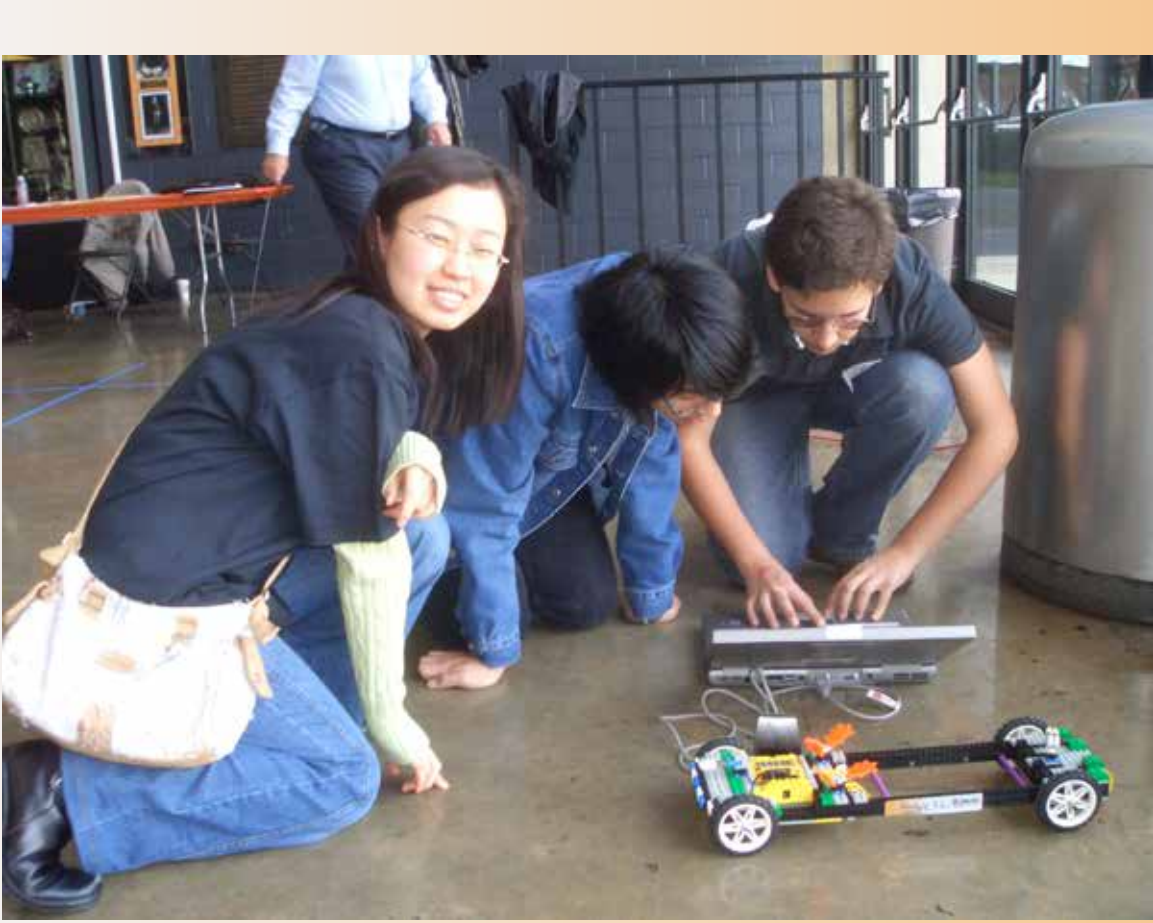
- Lab Tours
- Demonstrations at Science Fairs/Expos
- Judging Science Competitions
- Recruiting Underrepresented Minorities



Richard Cendjias talks about what he does in the lab to a group of K-12 students.



David Miller and Kang Sun demonstrate a laser at the SEEExpo.



Yu Yao helps judge a science competition.



Kara Kennedy joins Roxanne at the AISES Conference to recruit for the REU program.



Impact on Course Offerings

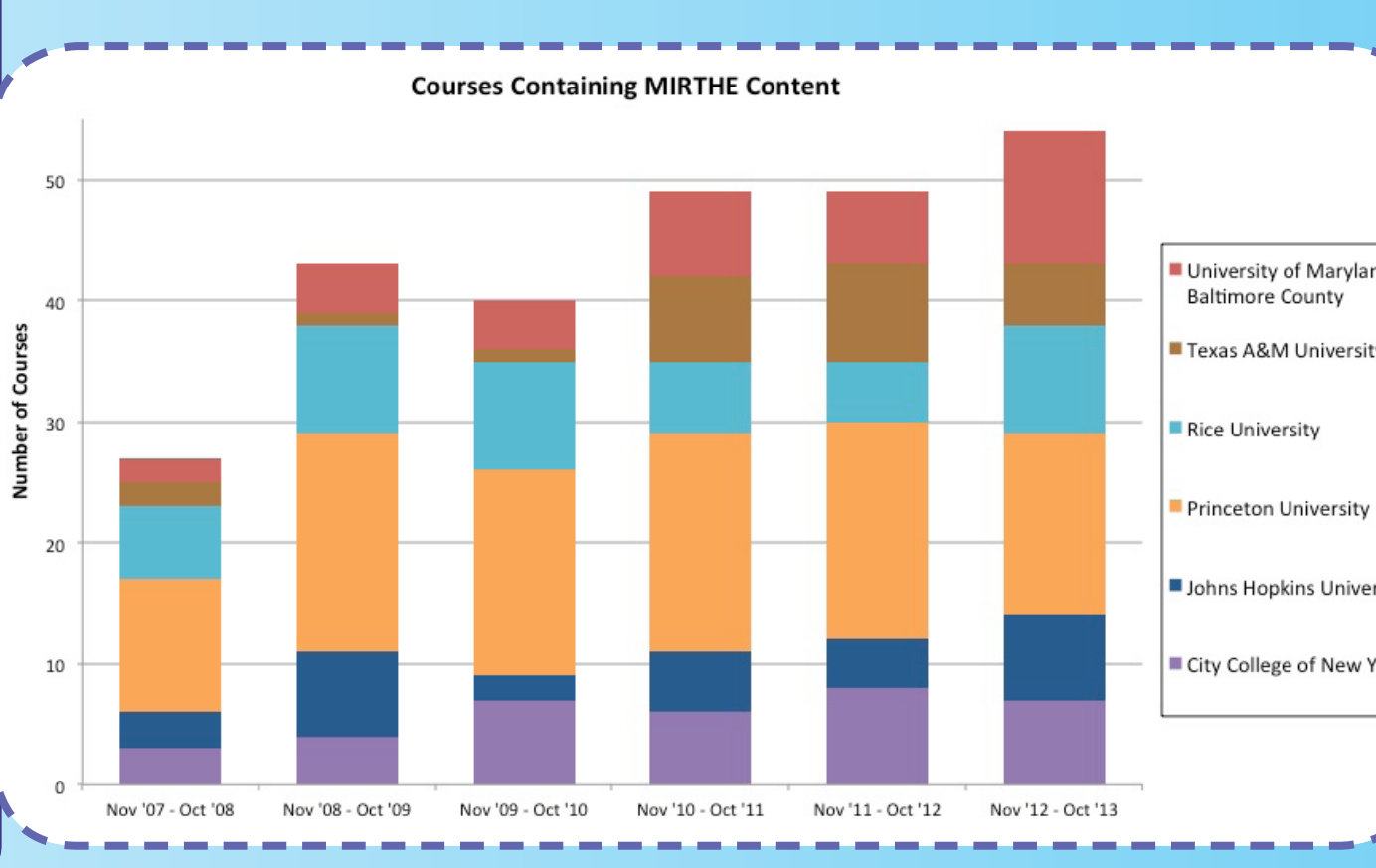
Engineering ethics courses emphasize responsibility

Claire F. Gmachl
MIRTHE (NSF-ERC) EEC-0540832

No longer just the province of the humanities, the study of ethics is having a greater role in engineering. In the fall 2010 semester, two courses—graduate and undergraduate—enrolled students for the complete professional and societal implications of conducting research and using new technologies to market.

Responding to both Princeton University and federal agency requirements, Gmachl volunteered to teach the ethics for engineers and worked with the Keller Center to plan and develop the content. It's not just for those in graduate studies. It's being used in a professional and societal ethics class for the University and a lot of resources in graduate education. "What we ask in terms of their honor code and their good judgment to solve societal problems. It's a big responsibility and it's important to tie up to."

Steven S. Schultz, *IEEE News*, Winter 2011, vol. 22, no. 12



A screenshot of the MIRTHE Video Course Catalog, found at the center's website.

MIRTHE Library

Reference Collection: A collection of reference books recommended by MIRTHE members in the Engineering Library at Princeton University.

Video Course Catalog: A free curriculum of videos of MIRTHE presentations. Presentations are given by MIRTHE faculty, students, and invited speakers. Videos can be selected from one of four subject areas (Lasers, Materials, Sensing Systems, Applications) and each area is divided into three learning levels (Introductory, Intermediate, Expert), making the curriculum accessible to scholars of different backgrounds/knowledge.



Students selecting books from the MIRTHE reference collection.

